P9.1

USE OF THE EOS/ASTER SPACEBORNE INSTRUMENT IN THE REMOTE SENSING OF LAND SURFACE WATER AND ENERGY BALANCES

John P. Schieldge*
California Institute of Technology, Jet F'repulsion Laboratory

1. Introduction

The Advanced Spaceborne Thermal and Emission Reflection Radiometer (Aster) is a multispectral, high-spatial resolution imaging instrument that is scheduled to fly on NASA's Earth Observation System (EOS-AM1) in June 1998. The instrument has three visible and near infrared (VNIR) bands with 15-m spatial resolution, six shortwave infrared (SWIR) bands with 30-m spatial resolution, and five thermal infrared (TIR) bands with 90-m spatial resolution. In addition, the instrument has stereo imaging capability along the same orbit - at 15-m spatial resolution - that is made possible by combining data from a nadir viewing sensor and an aft pointing sensor viewing **in the near infrared.**

ASTER is a joint US/Japan venture. The Japanese Government has charged the Ministry of International Trade and industry (MITI) to build the instrument. The ASTER project is implemented under the aegis of the Earth Resources Satellite Data Analysis Center (ERSDAC) and the Japan Resources Observation System Organization (JAROS). These are non-profit organizations that are under the control of MITI. JAROS is responsible for the design and development of the ASTER instrument by contracting the activity to a number of Japanese manufacturers (NEC, MELCO, Fujitsu, Hitachi).

The ASTER science team is an international group of US, Japanese, and other scientists who are responsible for mission planning, development of algorithms for data reduction, processing, and analysis, and calibration and validation activities associated with the instrument data collection process.

2. INSTRUMENT DESCRIPTION AND OPERATIONS

The ASTER instruments are enclosed in a 1.6x 1.6 x O,9 m^3 package that has three separate radiometer subsystems (VNIR, SWIR, TIR). The VNIR subsystem has two telescope assemblies: (1) a radiometer with three bands (0.52-0.60 , 0.63-0.69,0.76-0.86 µm) viewed at nadir, and (2) a separate aft viewing radiometer inclined backward at an angle of 27.6° with a single near infrared band (0.76-0.86 µm). The SWIR subsystem has six bands (1 .60- 1.70, 2.145-2.185, 2.1 85-2 .225,2.235-2.285,2.295-2.365,2,360-2.430 µm) and a nadir viewing telescope assembly. The TIR subsystem also uses one nadir viewing telescope assembly and has five bands (8.125-8,475, 8.475-8.825,8 .925-9 .275,10 .25-10 .95,10 .95-11 .65 µm).

The swath width for all three subsystems is 60 km. A cross-track pointing capability exists for the VN IR subsystem (24° off nadir) and the SWIR and TIR subsystems (8.55° off nadir). This cross-track pointing capability ensures that any point on earth will be covered at least once every five days for VNIR and every 16 days for SWIR and TIR.

ASTER's duty cycle is 80/. which will yield over 700 scenes (60 x 60 km) per day, ASTER data will be processed using a set of algorithms to produce standard and non-standard data products that fall into one of five categories (Levels 0,1 ,2,3,4). Level O data is the raw data collected by the instruments, and the other levels pertain to data that has been processed and/or analyzed.

3. APPLICATION TO LAND SURFACE ENERGY AND WATER BALANCE STUDIES

ASTER data products will be useful to hydrologic and meso/micrometeorological studies of the surface water and energy balance. The basic geophysical parameters that will be produced from ASTER data are surface emitted and reflected radiance, surface temperature, emissivity and reflectance, and digital elevation models (DEMs).

These basic parameters will not only provide values of surface parameters at high spatial resolution, but also will be useful in providing data that can be used in formulations of estimates of heat (latent and sensible) flux densities at the surface, vegetation cover, and soil moisture content. The high spatial resolution of the measurements provides large sots of data that can be used to analyze how the strength of hydrologic and meteorological processes at the surface vary with scale.

Corresponding author address: John P. Schieldge, California Institute of Technology, Jet Propulsion Laboratory, MS 183-501, Pasadena, CA 91 109; email <john@lithos.jpl.nasa.gov>